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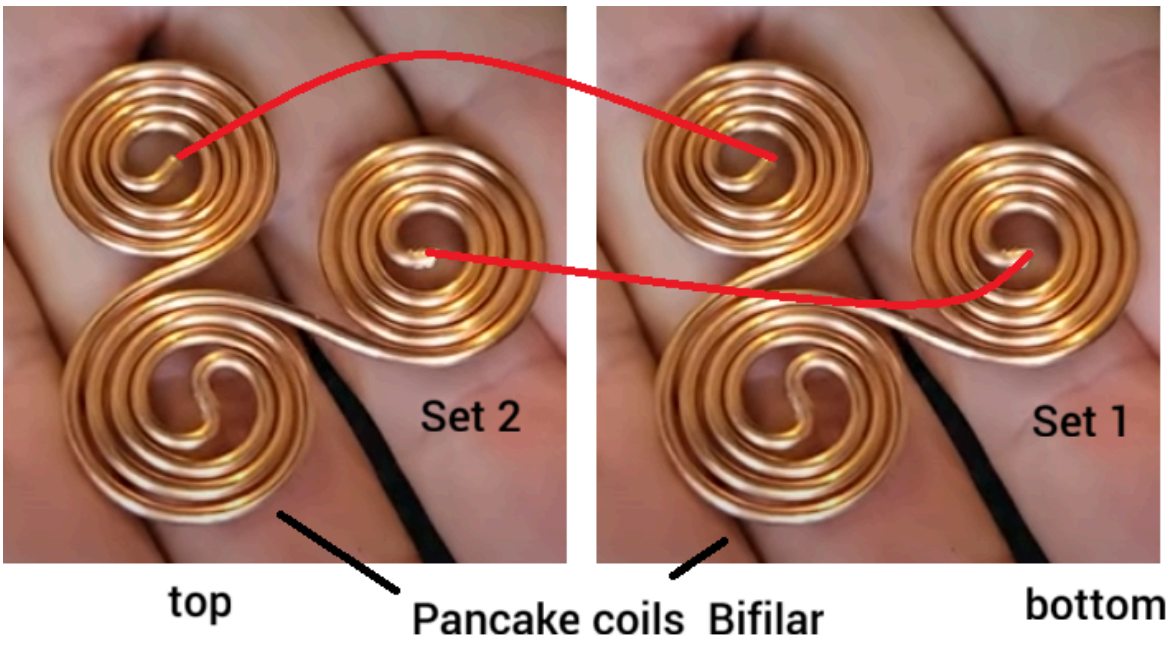

Electron Harvest with a Stacked Bifilar Pancake Coil

Simplified Rectenna Work for the World's Use

Written by Daniel Donatelli – Secure Supplies Group

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1) Introduction

Stacking triskelion-style **bifilar pancake coils** creates a high-Q resonant structure that acts as an *electron harvester*. It does **not** make “free power.” Instead, it couples small amounts of ambient RF/EMF energy and, with proper **bias, rectification, one-way control, storage, and regulation**, progressively builds charge in a capacitor bank for later, practical use.

2) Safety & Risk Notice (Read First)

High voltage, stored energy, and hydrogen gas are dangerous. Proceed only if you understand the risks.

- **Field intensity hazards:** Do **not** operate near **radio/TV stations, cellular towers, or HV transmission lines.** Strong fields can drive large induced currents and cause dangerous **surges/spikes** in your circuit.
- **Environment effects: Altitude** (lower air density) reduces breakdown voltage → easier arcing. **Humidity** raises breakdown voltage and can change output. Expect yield to vary with weather and elevation.
- **Personal protection:** Wear **insulated gloves and rubber-soled shoes**. Work on dry, non-conductive surfaces. **Never work alone**—teams of **2+** with a safety plan and an emergency power-cut method.
- **Surge & spike protection:** Include **TVS diodes, fuses, spark gaps, RC snubbers, ideal-diode elements** and proper **earthing/grounding**. Expect **voltage spikes, surges, and drop-outs** in resonant systems.
- **Scaling disclaimer:** If you scale voltage, coil size, or capacitor banks, **you do so at your own risk**. Higher energy = higher hazard. Use enclosures, spacing, and standoffs sized for the **worst-case**.
- **Energy storage:** Supercaps and **lithium batteries** can deliver lethal currents and/or ignite if mishandled. Use **balancing, BMS/chargers, proper fusing**, and isolation from the coil front-end.
- **Hydrogen handling:** If you integrate **voltrolysis**: use **flashback arrestors**, non-return valves, ventilated areas, no open flames/sparks, and appropriate codes of practice.

This system is **not free power**; it harvests energy already present. The intent is **education and research**. Check local regulations on RF emissions and hydrogen handling before use.

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3) What Happens in This Build

- **Bifilar pancake ≠ free voltage boost.** The Tesla-style bifilar raises **self-capacitance** between adjacent turns, enabling strong turn-to-turn voltages **at resonance**, not magically at DC.
- **Stacked sets = strong coupling.**
    - **Series-aiding** (same winding sense) → higher **L**, higher **Q**, lower $\mathbf{f_0}$.
    - **Series-opposing** → field cancelation, Q collapse.
- **Self-resonant LC.** Spiral **L** + inter-turn/inter-layer **C** → resonance typically **100s kHz to a few MHz** (geometry dependent).
- **Losses.** Skin & proximity effects increase AC resistance; **Litz wire**, spacing, and careful layout reduce loss.

4) Ambient Electron Harvest

- **Urban RF levels:** roughly **tens of μW/m² to mW/m²**. A palm-sized coil gathers tiny fractions of a milliwatt.
- **Progressive storage:** Rectify → **one-way** → **capacitor bank**. Voltage climbs slowly; energy becomes usable in **bursts** or for **trickle** tasks.
- **Biasing: Voltage doublers/multipliers** let the storage node reach higher voltages so the same coulombs store **more joules**: E=12CV2E=\tfrac12CV^2E=21CV2.

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5) Bias, Rectify, Double, Store, Regulate

- **Front-end:** Tuned coil → **low-leakage Schottky bridge** *or* **synchronous/ideal rectifier** (lower drop at small signals).
- **Voltage doubler:** Greinacher (2× diodes + 2× caps) before/after the bridge to increase storage voltage.
- **One-way control: Ideal-diode** or Schottky to **block back-discharge** into the coil.
- **Storage bank:** Supercaps (with **balancing**) or low-ESR electrolytics; scale to target bus.
- **Regulation:**
    - **USB 5 V** buck/buck-boost (very low quiescent current).
    - **12–48 V DC** boost/buck-boost for tools, chargers, or voltrolysis drivers.

Why it works: AC trickle → rectified DC → doubled **V** → stored in **C** → regulated to standard rails. Tiny inputs become practical via **time + storage + conditioning**.

6) Path to a Regulated Supply (USB 5 V + 12–48 V DC)

1. **Pick source band** (e.g., **~150 kHz** if you plan demos on a **Qi pad**).
2. **Tune coil** (L & film-C) for a sharp resonance at that band.
3. **Rectify** (Schottky or synchronous), add **doubler**.
4. **One-way** ideal diode to **storage node**.
5. **Supercap bank** (with balancers) accumulates charge.
6. **Enable** regulators only above thresholds (avoid idle drain):
    - **5 V USB** out, and
    - **12/24/36/48 V** adjustable DC terminal.

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7) Bill of Materials (BOM)

Coil & Tank

- Litz wire (100–660 strand; AWG 38–44 equiv.)
- Polypropylene **film caps**: 47 nF, 100 nF, 220 nF (low ESR)

Rectification & Doubling

- RF **Schottkys**: BAS70 / BAT54 / HSMS-285x / SMS7630
- **Ideal-diode** ICs: LTC4412, MAX40200; active bridge (LT4320) for stronger sources
- NP0/C0G ceramics for the doubler: 10–100 nF

Storage

- **Supercaps** 2.7 V, 10–100 F (series as needed) + **balancing** boards
- Low-ESR polymer electrolytics 470–2200 µF (16–50 V)

Regulators

- **USB 5 V**: ultra-low-Iq buck-boost module (e.g., TPS61236 class)
- **12–48 V**: adjustable boost/buck-boost module (e.g., MP3424/XL6009/DROK)

Protection & Housekeeping

- TVS diodes (e.g., SMBJ5.0A / SMBJ58A), polyfuses, spark gaps where appropriate
- Mini **voltmeter** on storage bus; **ideal-diode** elements on all rails

Optional Battery Interface

- Charger/BMS for Li-ion/LFP/lead-acid matched to your pack; **blocking** device to prevent back-feed

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8) Example Values & Tuning

- **Target f_0: ~150 kHz** (Qi-demo)
- **L (stacked, series-aiding): ~12 µH**
- **Tank C (film):** C≈1(2πf0)2LC\approx \frac{1}{(2\pi f_0)^2L}C≈(2πf0)2L1 → **≈ 94 nF** at 150 kHz/12 µH
- **Doubler caps:** NP0/C0G **10–47 nF**
- **Storage (ambient mode):** 2× supercaps 2.7 V/25–100 F in series (≈ 5.4 V bus) with **active balancing**
- **Outputs:** USB 5 V buck-boost + 12–48 V adjustable boost (enable-pin controlled)

9) Notes for Maximum Performance

- **Litz & spacing** → higher Q, lower AC loss.
- **Keep metal** away from the coil; use non-metallic standoffs.
- **Measure** with nanoVNA or FG+scope; tune for a sharp S11 dip.
- **Gate** converters on thresholds; don’t parasitize your own harvest.
- **Thermal & surge margins**: size parts for worst-case spikes.

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10) Voltrolysis & Donatelli Tube Cells (Nano-Bubble Water Fuels)

Concept. Use the harvested/stored energy to power a **high-voltage, low-current pulsed driver** feeding **Donatelli tube cells** (concentric stainless tubes) with **distilled water only**. Pulsed high fields encourage **nano-bubble H_2/O_2** production without conventional electrolytes.

Integration path.

- Harvester **supercap/battery** → **HV pulsed driver** (isolated output; adjustable duty & frequency in the kHz range).
- Driver → **tube cell** (proper spacing/insulation to avoid continuous arcs).
- **Safety**: flashback arrestors, non-return valves, ventilation, no ignition sources.
- **Use cases**: on-demand fuel assist, burners, experimental engines.
  (Engineering note: this section is for R&D; follow gas and electrical codes.)

11) Applications (Schools, Homes, Labs)

- **STEM builds** (rectenna principles, resonance, RF safety).
- **Off-grid sensors** (trickle storage + burst operation).
- **Demonstrator** near intentional transmitters (Qi pads) for visible output.
- **R&D** for nano-bubble water fuel experiments (with strict safety).

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12) Step-by-Step Assembly Instructions

A) Electron Harvester & Storage

1. **Wind & Stack the Coils**
    - Two identical **bifilar pancakes**, stacked **series-aiding** (same winding sense).
    - Mount on a non-metallic plate with standoffs.
2. **Add the Tank Capacitor**
    - Solder a **film capacitor** across the coil terminals. Start near **100 nF**, socket/clip for easy swaps.
3. **Probe & Tune Resonance**
    - With a nanoVNA/FG+scope, sweep to find the **resonant dip/peak**. Trim **C** (and spacing) for your target $\mathbf{f_0}$.
4. **Rectifier & Voltage Doubler**
    - Connect coil → **Schottky bridge** (or synchronous rectifier).
    - Add **Greinacher doubler** (2× diodes + 2× NP0 caps). Keep leads short.
5. **One-Way (Ideal-Diode) to Storage Bus**
    - Insert an **ideal-diode controller** (or low-loss Schottky) from rectified node to **storage bus**.
6. **Capacitor Bank & Meters**
    - Fit **supercaps** (series with balancing) or low-ESR electrolytics.
    - Add a **voltmeter** and optional **threshold comparator** LED (“ready” indicator).
7. **Regulators (Outputs)**
    - **USB 5 V** buck/buck-boost → USB-A/C jack, polyfuse.
    - **12–48 V** adjustable boost/buck-boost → DC terminals.
    - Wire **EN pins** to a threshold circuit so converters only turn on above a safe bus voltage.
8. **Protection & Enclosure**
    - Add **TVS, fuses, spark gaps** (as appropriate).
    - Enclose in a **non-metallic** case; keep coil face unobstructed; provide strain relief.

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B) Optional: Voltrolysis Integration

9. **HV Pulsed Driver**
    - From storage/battery, feed a **galvanically isolated** HV pulser (kHz, adjustable duty).
    - Size creepage/clearance; include **snubbers** and **EMI filters**.
10. **Donatelli Tube Cell**

- Concentric SS tubes; **distilled water**; proper **insulation & spacing**.
- Route gas through **flashback arrestors** and non-return valves.

11. **Commissioning**

- Verify no leaks; confirm **no continuous arcing**.
- Bring up duty/frequency slowly while monitoring temperature, current, and gas output.

Throughout: log measurements; adjust only one variable at a time.

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13) Troubleshooting & FAQs

No harvest / no rise on the storage bus

- Off-resonance: re-tune **C**; verify **series-aiding** wiring; increase coil spacing.
- Rectifier drop too high: use **synchronous/ideal** rectification.
- Idle drains: disable converters until threshold.

Coil runs hot / low Q

- Switch to **Litz wire**; increase turn spacing; remove nearby metal; re-tune.

Strong interference / noisy scope

- Improve **grounding/shielding**; add **EMI filters**; increase distance from sensitive gear.

USB 5 V won't hold under load

- Storage bus too low: increase storage **C** or harvest power (intentional source).
- Converter Iq too high: pick a **lower-Iq** module; enable only above threshold.

Voltrolysis: no gas production

- Ensure **distilled water only**; wrong frequency/duty; electrode spacing/arcing; insufficient HV.

Voltrolysis: excess heating

- Current too high → reduce duty/voltage; verify no electrolyte contamination; improve insulation.

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FAQ

- *Can I use tap water?* **No**. Use **distilled water** to avoid conduction, scaling, and runaway current.
- *What frequency works best?* Start in the **kHz** range; tune empirically for your geometry and driver.
- *Can this charge a phone from ambient?* Ambient alone → **very slow trickle**. Place over a **Qi pad** or other intentional transmitter for practical power.
- *Is this free energy?* **No.** It harvests existing fields and stores them for later use.

14) Comparison: Voltrolysis vs. Conventional Electrolysis

Aspect	Voltrolysis (HV, low-I, no electrolyte)	Conventional Electrolysis (LV, high-I, electrolyte)
Drive	Pulsed **high voltage**, low current	Steady **low voltage**, high current
Water	**Distilled only** (dielectric)	Requires **electrolyte** (e.g., KOH/NaOH)
Heat	Lower bulk heating (pulsed)	Significant **ohmic heating**
Electrodes	Less corrosion (no salts)	Corrosion/scaling common
Control	Frequency/duty/spacing critical	Current density & chemistry dominant
Gas form	Fine **nano-bubbles** possible	Larger bubbles typical
Complexity	Driver + insulation & spacing	Simpler DC + chemistry
Safety	HV & RF hazards	Caustic electrolyte & gas hazards

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16) Closing Notes & Statement from Mr. Donatelli

This work is **shared freely** so every classroom and home can **learn, build, and improve**. While some have **suppressed or attacked** these ideas, we place them **in the public's hands**—permanently. Use this guide responsibly, advance it ethically, and pass it on.

> **— Mr. Daniel Donatelli, Secure Supplies Group**
> *"Simplifier of Rectenna Work for the World's Use."*

17) Document Rating & Next Improvements

Daniel Donatelli's Self Rating (this edition): 9.6 / 10.

Future improvements (R&D): advanced **synchronous rectifiers**, higher-Q coil geometries/materials, and **integration into consumer-ready rectenna modules**.

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